

## SIGNAL ANALYSIS OF NEY PERFORMANCES

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### ABSTRACT

Ney is an end-blown flute which is mainly used for Makam music. Although from the beginning of 20<sup>th</sup> century a score representation based on extending the Western music is used, because of its rich articulation repertoire, actual Ney music can not be totally represented by written score. Ney is still taught and transmitted orally in Turkey. Because of that the performance has a distinct and important role in Ney music. Therefore signal analysis of ney performances is crucial for understanding the actual music. Another important aspect which is also a part of the performance is the articulations that performers apply. In Makam music in Turkey none of the articulations are taught even named by teachers. Articulations in Ney are valuable for understanding the real performance. Since articulations are not taught and their places are not marked in the score, the choice and character of the articulation is unique for each performer which also makes each performance unique.

Our method analyzes audio files of well known Turkish Ney players. In order to obtain our analysis data, we analyzed audio files of 8 different performers vary from 1920 to 2000.

### 1. INTRODUCTION

Makam music in Turkey has specific characteristics that require specific analysis approaches [?] and there has been very few computational studies that focus on it.

Makam music in Turkey is mainly an oral tradition and thus the audio recordings become a fundamental source of information for its study [?]. For this research approach we need well annotated large data sets, and we need to extract the appropriate audio features from which to then perform musically meaningful computational studies. Another important characteristics of makam music are the expressive articulations, they are more than simple expressive resources, in fact they are essentials of the music [?].

### 2. NEY

Ney is one of the oldest and most characteristic blown instrument of makam music in Turkey. It is an end-blown

flute and made of reed which is mainly used for makam music. From the beginning of the 20<sup>th</sup> century a score representation which was developed by extending the Western music is used. However the written scores are far from the music that is actually performed. Therefore we made a signal analysis approach in order to understand the actual performances.

Ney has a real importance and solid place in Turkish classical and religious music. The Turkish ney has six finger-holes in front and a thumb-hole in back. Although it is highly dependent on the talent and experience of the performer, a ney can produce any pitch over a two-and-a-half octave range or more. Nearly all Turkish neys have a mouthpiece made of water buffalo horn, or sometimes ivory, ebony, plastic, or a similar durable material. Also there are different sizes of neys', ranging from the Davud ney (95 cm long), to the highest, Bolahenk Nisfiye ney (52.5 cm long).

Ney tradition is transmitted via master-pupil relationship in Turkey. The only way to learn how to play is from listening the masters, which makes it very hard. Written scores only represent the border lines of the pieces. One of the important aspect of ney performance is the expressive articulations that ney players apply. These expressive articulations are never marked or even explicitly taught. Moreover as Tura stated in his book one of the most expressive articulation of makam music is vibrato and without vibrato, makam music is considered dry, monotonous and not deemed as acceptable [?]. This is specially so in ney music. Although we have not found any documents describing the techniques used, our study shows the existence of clear patterns in the performance of these embellishments.

Therefore for our study we made interviews with well known ney players of Turkey. From our interviews we realized that the naming of ney embellishments is a problem in Makam music. The Ney players we interviewed agreed on naming frequency and amplitude modulation as *Vibrato*. However they all had difficulty naming the expressive articulation that is widely used for connecting two consecutive notes and that in some Makam literature is called *Kaydırma*<sup>1</sup>.

From our initial quantitative studies we found that vibrato and kaydırma are the most used expressive articulation.

<sup>1</sup> The literal translation can be *sliding*, however the purpose of this behavior is to give the feeling of non-edge connections all through the piece rather than sliding between notes. Possible the most similar expressive articulation in western music is the *portamento*.

### 3. DATA

For our analysis we annotated 8 different performers from different eras. Our set contains recordings starting from 1930's to now. Our concern was to apply state of the art signal analysis techniques to audio recordings of ney performances. Our data set includes 8 different performer, 58 minutes of audio, and 15 different makams, summarized in Table ??.

Performer	Birth Date	Time (Min.)	Makams
Hayri Tümer	1905	7.75	Rast, Saba, Dügah
Ulvi Ergüner	1924	7.33	Hicaz, Saba
Niyazi Sayın	1927	7.66	Buselik, Hicazkar, Hüseyini, Rast
Aka Gündüz Kutbay	1934	7.12	Hüseyini, Nihavend
Salih Bilgin	1960	8.50	Beyati, Sultaniyegah
Sadrettin Özçimi	1964	11.20	Hicazkar, Pençgah
Ömer Bildik	1976	2.33	Evcara, Acem
Burcu Sönmez	1981	5.50	Ferahnak, Uşşak

Table 1. Performers with their test data.

We are covering some of the most acknowledged ney players. According to our oral discussions with professional Turkish ney players, Niyazi Sayın and Aka Gündüz Kutbay are considered as one of the most influential ney players of today. However because of the sudden death of Aka Gündüz Kutbay at the age of 45, most of the recent players are influenced by Niyazi Sayın. Through the oral discussions with Ali Tan<sup>2</sup>, he stated that even in Turkish Conservatories teachers follow the way of Niyazi Sayın.

Moreover, most of the ney players (both amateur and professional), who even did not have a chance to study with Niyazi Sayın, they consider themselves as students of his by listening and studying his recordings. In our test set Salih Bilgin and Sadrettin Özçimi are one of the most famous students of Niyazi Sayın. Burcu Sönmez is a student of both Salih Bilgin and Niyazi Sayın. Ömer Bildik is a student of Sadrettin Özçimi. All these ney players have the influence of Niyazi Sayın.

In our analysis set, in order to avoid lineage bias we also include some old ney players recordings like Hayri Tümer, Aka Gündüz Kutbay and Ulvi Ergüner, who are also well-known and highly respected ney players with distinct styles.

For the statistical significance, all pieces vary in tempo and also chosen from different Makams.

### 4. SIGNAL ANALYSIS

We extract the fundamental pitch(F0) from audio files. In Figure ??, a ten second excerpt can be seen. Each recording is measured in the 1/3 Holderian Comma (HC) resolution. We choose this resolution because it is considered as the highest precision we could find in theoretical pitch scale studies [?].

To obtain a f0 estimation of each solo ney recording, Makam Toolbox was used [?]. Makam Toolbox uses an implementation of Yin [?] with hop size of 10ms for fundamental frequency estimation. On the top of the f0 implementation Makam Toolbox makes a post-processing for octave correction.

<sup>2</sup>Ali Tan is a full-time research assistant in Istanbul Technical University Turkish Conservatory in the Ney performance department. <http://www.neyzenalitan.com/>.

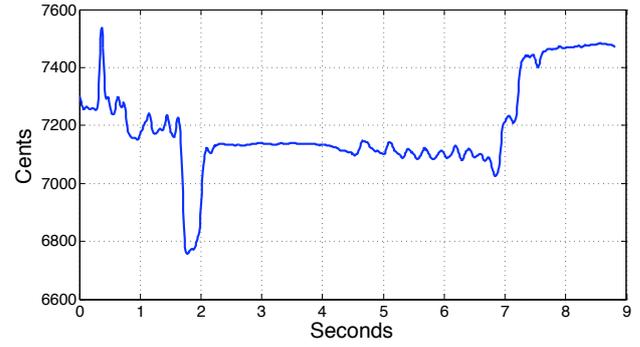


Figure 1. Fundamental frequency of a example portion of a ney recording.

As seen in the figure, the only part that has a possible constant note value is between 2<sup>nd</sup> and 4<sup>th</sup> seconds. Except this part player applied different kinds of expressive articulations. For instance between 5<sup>th</sup> and 7<sup>th</sup> there is obvious vibrato. However the rate and the extend values of vibrato is not constant. According to our analysis [?], vibrato is the most common expressive articulation, however its characteristic is much more different than Western examples.

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